

## Social Determinants of Ethnic Disparities in SARS-CoV-2 Infection: UK Biobank Seroprevalence Study

### Supplementary Appendix, Table of contents

|   | Page |
|---|------|
| <b>Table S1:</b> Variables used to select participants  | 2    |
| <b>Table S2:</b> Number of participants that returned a blood sample each month, and whether they were positive for SARS-CoV-2 antibodies   | 4    |
| <b>Table S3:</b> Operational definitions of variables, and categories used in analyses  | 5    |
| <b>Table S4:</b> Demographic characteristics of the participants of the UK Biobank Seroprevalence Study and, for comparison, the 2021 UK Population   | 8    |
| <b>Table S5:</b> Participants characteristics and their social circumstances during the first wave of the pandemic, by ethnicity  | 11   |
| <b>Table S6:</b> Odds ratios for SARS-CoV-2 seropositivity by ethnicity, progressively adjusted for potential explanatory factors (among participants who returned a sample in either June or July 2020*) | 12   |
| <b>Figure S1:</b> Flowchart of participant recruitment  | 13   |

**Table S1: Variables used to select participants**

| Selection variable                | Subcategories  | Definition or source   |
|-----------------------------------|--|--|
| Geographic region (postcode area) | Aberdeen / Bath / Birmingham / Blackburn / Blackpool / Bolton / Bournemouth / Bradford / Brighton / Bristol / Bromley / Cambridge / Canterbury / Cardiff / Carlisle / Central London / Central London / Chelmsford / Chester / Cleveland / Colchester / Coventry / Crewe / Croydon / Darlington / Dartford / Derby / Doncaster / Dorchester / Dudley / Dumfries and Galloway / Dundee / Durham / East London / Edinburgh / Enfield / Exeter / Falkirk and Stirling / Galashiels / Glasgow / Gloucester / Guildford / Halifax / Harrogate / Harrow / Hemel Hempstead / Hereford / Huddersfield / Hull / Ilford / Inverness / Ipswich / Kilmarnock / Kingston upon Thames / Kirkcaldy / Kirkwall / Lancaster / Leeds / Leicester / Lincoln / Liverpool / Llandrindod Wells / Llandudno / Luton / Manchester / Milton Keynes / Motherwell / Newcastle upon Tyne / Newport / North London / North West London / Northampton / Northern Ireland / Norwich / Nottingham / Oldham / Outer Hebrides / Oxford / Paisley / Perth / Peterborough / Plymouth / Portsmouth / Preston / Reading / Redhill / Rochester / Romford / Salisbury / Sheffield / Shrewsbury / Slough / South East London / South West London / Southall / Southampton / Southend-on-Sea / St Albans / Stevenage / Stockport / Stoke-on-Trent / Sunderland / Sutton / Swansea / Swindon / Taunton / Telford / Tonbridge / Torquay / Truro / Twickenham / Wakefield / Walsall / Warrington / Watford / West London / Wigan / Wolverhampton / Worcester / York | Population estimates sourced from the 2011 Census were used to identify the number of participants required from each postcode area to achieve a geographically representative sample of the UK.(Office for National Statistics)                         |
| Socioeconomic status              | More deprived / average / less deprived  | Townsend Deprivation Score tertiles were calculated across UK Output Areas and assigned to participants based on their postcode. These were used to determine socioeconomic status. Data were sourced from the UK Data Service based on the 2011 Census. |
| Age (years)                       | <30 / 30 – <40 / 40 – <50 / ≥50 (offspring)<br><60 / 60 – <70 / ≥70 (UK Biobank participants)  | Defined as age on 1 <sup>st</sup> January 2020   |

|                            |                                     |  |
|----------------------------|-------------------------------------|--|
| Sex                        | female / male                       | Specified by participant   |
| Ethnicity                  | white / non-white                   | Participants were defined as white if they specified their ethnicity as 'white', 'white British', 'white Irish' or 'any other white background'  |
| Urban-rural classification | urban / rural                       | The 2011 Rural-Urban Classification (used for English and Welsh addresses) defines urban Output Areas as built-up areas with a population of 10,000 or more. The Scottish Government Urban Rural Classification version 2016 (used for Scottish addresses) defines urban Output Areas as settlements with a population of 10,000 or more. (Department for Environment, 2013; Geographic Information Science & Analysis Team, 2018) |
| London-based               | London-based / based outside London | Participants were defined as London-based if their address was located within any of the following postcode areas: Bromley, Central London, Croydon, Dartford, East London, Enfield, Harrow, Ilford, Kingston upon Thames, North London, North West London, South East London, South West London, Southall, Sutton, Twickenham, Watford, West London   |

**Table S2: Number of participants that returned a blood sample each month, and whether they were positive for SARS-CoV-2 antibodies**

| Month of sample collection | Number of participants returning samples | Number of participants who tested positive | Number of new positives |                     |      |
|----------------------------|--|--|-------------------------|---------------------|------|
|                            |  |  | White ethnicity         | Non-white ethnicity | All* |
|                            |  |  |                         |                     |      |
| May                        | 1479                                     | 79   | 73                      | 5                   | 79   |
| June                       | 14254                                    | 956  | 758                     | 197                 | 956  |
| July                       | 17384                                    | 1229                                       | 303                     | 44                  | 347  |
| August                     | 16740                                    | 1134                                       | 20                      | 4                   | 24   |
| September                  | 16481                                    | 1131                                       | 45                      | 8                   | 53   |
| October                    | 16202                                    | 1247                                       | 86                      | 15                  | 101  |
| November                   | 12172                                    | 1067                                       | 115                     | 21                  | 136  |
| December                   | 56                                       | 13   | 2                       | 1                   | 3    |
| Total                      | 18887                                    | 1669                                       | 1402                    | 295                 | 1669 |

Analyses among all participants recruited into the UK Biobank SARS-CoV-2 Seroprevalence Study. \*Includes participants of unknown ethnicity.

**Table S3: Operational definitions of variables, and categories used in analyses**

| Variables                  | Operational definition   | Categories using in main analyses   |
|----------------------------|--|---|
| Ethnicity                  | Self-reported at recruitment   | White (White British, White Irish, White, Any other white background); Black (African, Any other black background, Caribbean); South Asian (Indian, Pakistani, Asian or Asian British, Bangladeshi); Mixed (White and Asian, White and Black African, White and Black Caribbean, Mixed, Any other mixed background); Chinese (Chinese); and Other (Any other Asian background, Other ethnic group). |
| Age                        | Date of sample collection minus date of birth  | < 55, 55-59, 60-64, 65-69, 70-74, ≥75 years   |
| Sex                        | Self-reported at recruitment   | Female / male   |
| Urban-rural classification | The 2011 Rural-Urban Classification (used for English and Welsh addresses) defines urban Output Areas as built-up areas with a population of 10,000 or more. The Scottish Government Urban Rural Classification version 2016 (used for Scottish addresses) defines urban Output Areas as settlements with a population of 10,000 or more. (Department for Environment, 2013; Geographic Information Science & Analysis Team, 2018)   | Urban / rural   |
| UK region                  | Region of residence at recruitment   | East Midlands, East of England, London, North East, North West, Scotland, South East, South West, Wales, West Midlands, Yorkshire and the Humber  |
| Work location              | Derived from questionnaire on social factors administered at the end of the study. Response to the question “What was your employment situation in time period 1 (i.e. mid-March to end of June 2020)?” Participants were classified as: (1) working from home if they selected the option “employed/self-employed and working from home”; (2) working at a work place if they selected either “employed/self-employed and working with others at a workplace” or “employed/self-employed and working alone at a workplace; or (3) Retired | Work at a workplace; work from home; retired, unemployed & others; missing  |

|   |  |   |
|---|--|---|
|   | and others if they selected any of the other options.  |   |
| Work in NHS or social care                    | Derived from questionnaire on social factors administered at the end of the study. Derived from responses to two questions: (1) "At any time between 01 March and 30 November 2020 were you designated a key worker?" and (2) "Which keyworker occupation group was this role in?" Participants were classified as working in NHS or social care if they indicated they were key workers and selected the option NHS and social care when asked about the keyworker occupation group. Those who indicated that they were not keyworkers and keyworkers in other occupations groups were considered as non-NHS/social care workers. | Yes, no, missing                              |
| Work in close proximity with others           | Derived from questionnaire on social factors administered at the end of the study. Participants who indicated "Yes" in response to the question "At any time between 01 March and 30 November 2020 were you typically in close contact (defined as face-to-face within 1 metre for 10 minutes or more) with the public or co-workers as part of your job? , with options "Yes", "No" and "Prefer not to answer" (classified as 'missing in analyses).  | Yes, no, missing                              |
| Number of co-residents aged 18 years or under | Derived from questionnaire on social factors administered at the end of the study. Created by adding together the number of household members (since 01 January 2020; excluding respondent) in the following age groups: 0-4 years, 5-11 years and 12-18 years. Participants who indicated they live alone were assigned the value "0".  | 0,1,2, ≥3, missing                            |
| Number of co-residents aged > 18 years        | Derived from questionnaire on social factors administered at the end of the study. Created by adding together the number of household members (since 01 January; excluding respondent) in the following age groups: 19-29 years, 30-39 years, 40-49 years, 50-59 years, 60-69 years, 70-79 years and 80+ years. Participants who indicated they live alone were assigned the value "0".  | 0,1,2, ≥3, missing                            |
| Has a co-resident who works outside the home  | Derived from questionnaire on social factors administered at the end of the study. Participants who indicated "Yes" in response to the question "Do you live with someone who worked outside the home?"  | No (including 'no co-resident'), yes, missing |
| Public transport is usual mode of transport   | Derived from questionnaire on social factors administered at the end of the study. Participants who selected any of the following options when asked about their main mode of transportation when they were outside the  | Yes, no, missing                              |

|                            |   |   |
|----------------------------|---|---|
|                            | home in time period 1 (i.e. mid-March to end of June 2020): bus, taxi/uber, train, tube or personal vehicle – with non-household member.  |   |
| Frequency of shopping      | Derived from questionnaire on social factors administered at the end of the study. Derived from response to the question: “In time period 1 (i.e. mid-March to end of June 2020), how many days per week did you typically leave your home to go shopping?” | Never/ Less than once a week; 1 to 2 days per week; 3 to 4 days per week; missing |
| Deprivation                | Derived from participant’s postcode at recruitment. Deprivation defined by Townsend deprivation score for postcode; more deprived had score $\geq 2$ .  | More deprived; average deprivation; less deprived                                 |
| Highest level of Education | Derived from questionnaire on social factors administered at the end of the study. Derived from response to the question: “Which of the following qualifications do you have?”  | University or college; A-levels; O-levels or CSE; others; none; missing           |

**Table S4: Demographic characteristics of the participants of the UK Biobank Seroprevalence Study and, for comparison, the 2021 UK Population**

| Characteristic           | UK Biobank Serology Study – all recruited participants (n=20,203) | UK Biobank Serology Study – included in the main analyses (n=14,571) | 2021 UK Population (excluding N. Ireland)* |
|--------------------------|---|--|--|
| <b>Age (years)</b>       |   |  |  |
| <30                      | 10.3  | 7.4  | 18.8                                       |
| 30-39                    | 15.9  | 12.7   | 17.2                                       |
| 40-49                    | 12.8  | 11.9   | 16.0                                       |
| 50-59                    | 18.8  | 20.8   | 17.3                                       |
| 60-69                    | 20.1  | 23.3   | 13.6                                       |
| ≥70                      | 22.0  | 23.8   | 17.2                                       |
| <b>Sex</b>               |   |  |  |
| Female                   | 56.0  | 57.8   | 51.6                                       |
| Male                     | 44.0  | 42.1   | 48.4                                       |
| <b>Ethnicity</b>         |   |  |  |
| Black                    | 2.5   | 2.5  | 3.7  |
| Chinese                  | 0.7   | 0.9  | 0.8  |
| South Asian              | 2.8   | 2.7  | 7.8  |
| Mixed                    | 3.7   | 3.6  | 1.9  |
| White                    | 87.3  | 87.3   | 83.9                                       |
| Other                    | 2.7   | 2.9  | 2.0  |
| <b>Region</b>            |   |  |  |
| East of England          | 4.7   | 4.8  | 9.7  |
| South West               | 6.9   | 6.9  | 8.8  |
| London                   | 29.8  | 29.5   | 13.5                                       |
| East Midlands            | 6.0   | 6.1  | 7.5  |
| South East               | 12.9  | 13.3   | 14.3                                       |
| Scotland                 | 6.2   | 6.4  | 8.4  |
| West Midlands            | 6.9   | 6.8  | 9.2  |
| North West               | 10.8  | 10.5   | 11.4                                       |
| Yorkshire and The Humber | 7.8   | 7.5  | 8.4  |
| North East               | 4.1   | 4.1  | 4.0  |
| Wales                    | 3.9   | 4.0  | 4.8  |

\*Participants were not recruited from Northern Ireland into UK Biobank. Data: Office for National Statistics. 2021 Census. <https://census.gov.uk/census-2021-results> Accessed 10-06-2023



**Table S5: Participants characteristics and their social circumstances during the first wave of the pandemic, by ethnicity**

|  | All<br>(n = 14571) | White<br>(n = 12725) | Black<br>(n = 369) | South Asian<br>(n = 396) | Chinese<br>(n = 126) | Mixed<br>(n = 526) | Other<br>(n = 429) |
|--|--------------------|----------------------|--------------------|--------------------------|----------------------|--------------------|--------------------|
| <b>Age (years), mean (SD)</b>            | 55.6 (15.6)        | 55 (16.1)            | 60.9 (7.3)         | 61.8 (9.2)               | 62.5 (8.0)           | 54.0 (14.0)        | 63.5 (8.8)         |
| <b>Age (years), n (%)</b>                |                    |                      |                    |                          |                      |                    |                    |
| < 55                                     | 6038 (41.4)        | 5603 (44)            | 65 (17.6)          | 74 (18.7)                | 16 (12.7)            | 213 (40.5)         | 67 (15.6)          |
| 55-59                                    | 1671 (11.5)        | 1273 (10)            | 105 (28.5)         | 87 (22)                  | 28 (22.2)            | 111 (21.1)         | 67 (15.6)          |
| 60-64                                    | 1599 (11)          | 1232 (9.7)           | 93 (25.2)          | 73 (18.4)                | 31 (24.6)            | 83 (15.8)          | 87 (20.3)          |
| 65-69                                    | 1790 (12.3)        | 1486 (11.7)          | 54 (14.6)          | 83 (21)                  | 28 (22.2)            | 49 (9.3)           | 90 (21)            |
| 70-74                                    | 2211 (15.2)        | 1980 (15.6)          | 36 (9.8)           | 51 (12.9)                | 14 (11.1)            | 50 (9.5)           | 80 (18.6)          |
| 75+                                      | 1262 (8.7)         | 1151 (9)             | 16 (4.3)           | 28 (7.1)                 | 9 (7.1)              | 20 (3.8)           | 38 (8.9)           |
| <b>Sex, n (%)</b>                        |                    |                      |                    |                          |                      |                    |                    |
| Female                                   | 8431 (57.9)        | 7298 (57.4)          | 224 (60.7)         | 189 (47.7)               | 95 (75.4)            | 366 (69.6)         | 259 (60.4)         |
| Male                                     | 6140 (42.1)        | 5427 (42.6)          | 145 (39.3)         | 207 (52.3)               | 31 (24.6)            | 160 (30.4)         | 170 (39.6)         |
| <b>Urban-rural classification, n (%)</b> |                    |                      |                    |                          |                      |                    |                    |
| Rural                                    | 2052 (14.1)        | 1923 (15.1)          | 14 (3.8)           | 25 (6.3)                 | 6 (4.8)              | 60 (11.4)          | 24 (5.6)           |
| Urban                                    | 12519 (85.9)       | 10802 (84.9)         | 355 (96.2)         | 371 (93.7)               | 120 (95.2)           | 466 (88.6)         | 405 (94.4)         |
| <b>UK Regions</b>                        |                    |                      |                    |                          |                      |                    |                    |
| East Midlands                            | 894 (6.1)          | 776 (6.1)            | 22 (6)             | 29 (7.3)                 | 7 (5.6)              | 38 (7.2)           | 22 (5.1)           |
| East of England                          | 703 (4.8)          | 671 (5.3)            | 7 (1.9)            | 4 (1)                    | 4 (3.2)              | 9 (1.7)            | 8 (1.9)            |
| London                                   | 4292 (29.5)        | 3556 (27.9)          | 161 (43.6)         | 163 (41.2)               | 48 (38.1)            | 165 (31.4)         | 199 (46.4)         |
| North East                               | 596 (4.1)          | 528 (4.1)            | 10 (2.7)           | 16 (4)                   | 5 (4)                | 24 (4.6)           | 13 (3)             |
| North West                               | 1530 (10.5)        | 1358 (10.7)          | 37 (10)            | 32 (8.1)                 | 14 (11.1)            | 53 (10.1)          | 36 (8.4)           |
| Scotland                                 | 937 (6.4)          | 888 (7)              | 3 (0.8)            | 7 (1.8)                  | 5 (4)                | 18 (3.4)           | 16 (3.7)           |
| South East                               | 1937 (13.3)        | 1725 (13.6)          | 34 (9.2)           | 38 (9.6)                 | 20 (15.9)            | 71 (13.5)          | 49 (11.4)          |
| South West                               | 1000 (6.9)         | 896 (7)              | 16 (4.3)           | 21 (5.3)                 | 8 (6.3)              | 40 (7.6)           | 19 (4.4)           |
| Wales                                    | 587 (4)            | 548 (4.3)            | 3 (0.8)            | 6 (1.5)                  | 2 (1.6)              | 21 (4)             | 7 (1.6)            |
| West Midlands                            | 995 (6.8)          | 831 (6.5)            | 49 (13.3)          | 49 (12.4)                | 7 (5.6)              | 37 (7)             | 22 (5.1)           |
| Yorkshire and the Humber                 | 1100 (7.5)         | 948 (7.4)            | 27 (7.3)           | 31 (7.8)                 | 6 (4.8)              | 50 (9.5)           | 38 (8.9)           |

Analyses among 14,571 participants; exclusions as in figure 1. \*UK Biobank urban and rural area classification, based on postcode information that is matched to 2011 census information on population density.

Table S5 continued:

|   | All<br>(n = 14571) | White<br>(n = 12725) | Black<br>(n = 369) | South Asian<br>(n = 396) | Chinese<br>(n = 126) | Mixed<br>(n = 526) | Other<br>(n = 429) |
|---|--------------------|----------------------|--------------------|--------------------------|----------------------|--------------------|--------------------|
| <b>Work location</b>                              |                    |                      |                    |                          |                      |                    |                    |
| Work at a workplace                               | 3108 (21.3)        | 2635 (20.7)          | 134 (36.3)         | 109 (27.5)               | 21 (16.7)            | 122 (23.2)         | 87 (20.3)          |
| Work from home                                    | 4675 (32.1)        | 4122 (32.4)          | 85 (23)            | 106 (26.8)               | 36 (28.6)            | 219 (41.6)         | 107 (24.9)         |
| Retired, Unemployed & Others                      | 6711 (46.1)        | 5906 (46.4)          | 146 (39.6)         | 176 (44.4)               | 69 (54.8)            | 180 (34.2)         | 234 (54.5)         |
| Missing   | 77 (0.5)           | 62 (0.5)             | 4 (1.1)            | 5 (1.3)                  | -                    | 5 (1)              | 1 (0.2)            |
| <b>Work in NHS or social care, n (%)</b>          |                    |                      |                    |                          |                      |                    |                    |
| No  | 12350 (84.8)       | 10863 (85.4)         | 270 (73.2)         | 318 (80.3)               | 108 (85.7)           | 436 (82.9)         | 355 (82.8)         |
| Yes   | 1235 (8.5)         | 1038 (8.2)           | 61 (16.5)          | 39 (9.8)                 | 7 (5.6)              | 57 (10.8)          | 33 (7.7)           |
| Missing   | 986 (6.8)          | 824 (6.5)            | 38 (10.3)          | 39 (9.8)                 | 11 (8.7)             | 33 (6.3)           | 41 (9.6)           |
| <b>Work in close proximity with others, n (%)</b> |                    |                      |                    |                          |                      |                    |                    |
| No  | 9760 (67.0)        | 8645 (67.9)          | 189 (51.2)         | 232 (58.6)               | 88 (69.8)            | 343 (65.2)         | 263 (61.3)         |
| Yes   | 3372 (23.1)        | 2841 (22.3)          | 142 (38.5)         | 117 (29.5)               | 25 (19.8)            | 140 (26.6)         | 107 (24.9)         |
| Missing   | 1439 (9.9)         | 1239 (9.7)           | 38 (10.3)          | 47 (11.9)                | 13 (10.3)            | 43 (8.2)           | 59 (13.8)          |
| <b>Number of co-residents aged ≤18 years</b>      |                    |                      |                    |                          |                      |                    |                    |
| 0   | 11051 (75.8)       | 9590 (75.4)          | 281 (76.2)         | 312 (78.8)               | 112 (88.9)           | 391 (74.3)         | 365 (85.1)         |
| 1   | 1440 (9.9)         | 1242 (9.8)           | 46 (12.5)          | 45 (11.4)                | 10 (7.9)             | 62 (11.8)          | 35 (8.2)           |
| 2   | 1594 (10.9)        | 1470 (11.6)          | 22 (6)             | 25 (6.3)                 | 2 (1.6)              | 60 (11.4)          | 15 (3.5)           |
| 3+  | 418 (2.9)          | 370 (2.9)            | 15 (4.1)           | 8 (2)                    | 2 (1.6)              | 12 (2.3)           | 11 (2.6)           |
| Missing   | 68 (0.5)           | 53 (0.4)             | 5 (1.4)            | 6 (1.5)                  | -                    | 1 (0.2)            | 3 (0.7)            |
| <b>Number of co-residents aged &gt;18 years</b>   |                    |                      |                    |                          |                      |                    |                    |
| 0   | 3116 (21.4)        | 2679 (21.1)          | 116 (31.4)         | 65 (16.4)                | 38 (30.2)            | 120 (22.8)         | 98 (22.8)          |
| 1   | 8219 (56.4)        | 7401 (58.2)          | 146 (39.6)         | 146 (36.9)               | 53 (42.1)            | 276 (52.5)         | 197 (45.9)         |
| 2   | 1961 (13.5)        | 1632 (12.8)          | 58 (15.7)          | 97 (24.5)                | 16 (12.7)            | 83 (15.8)          | 75 (17.5)          |
| 3+  | 1215 (8.3)         | 967 (7.6)            | 44 (11.9)          | 82 (20.7)                | 19 (15.1)            | 46 (8.7)           | 57 (13.3)          |
| Missing   | 60 (0.4)           | 46 (0.4)             | 5 (1.4)            | 6 (1.5)                  | -                    | 1 (0.2)            | 2 (0.5)            |

Analyses among 14,571 participants; exclusions as in figure 1.

Table S5 continued:

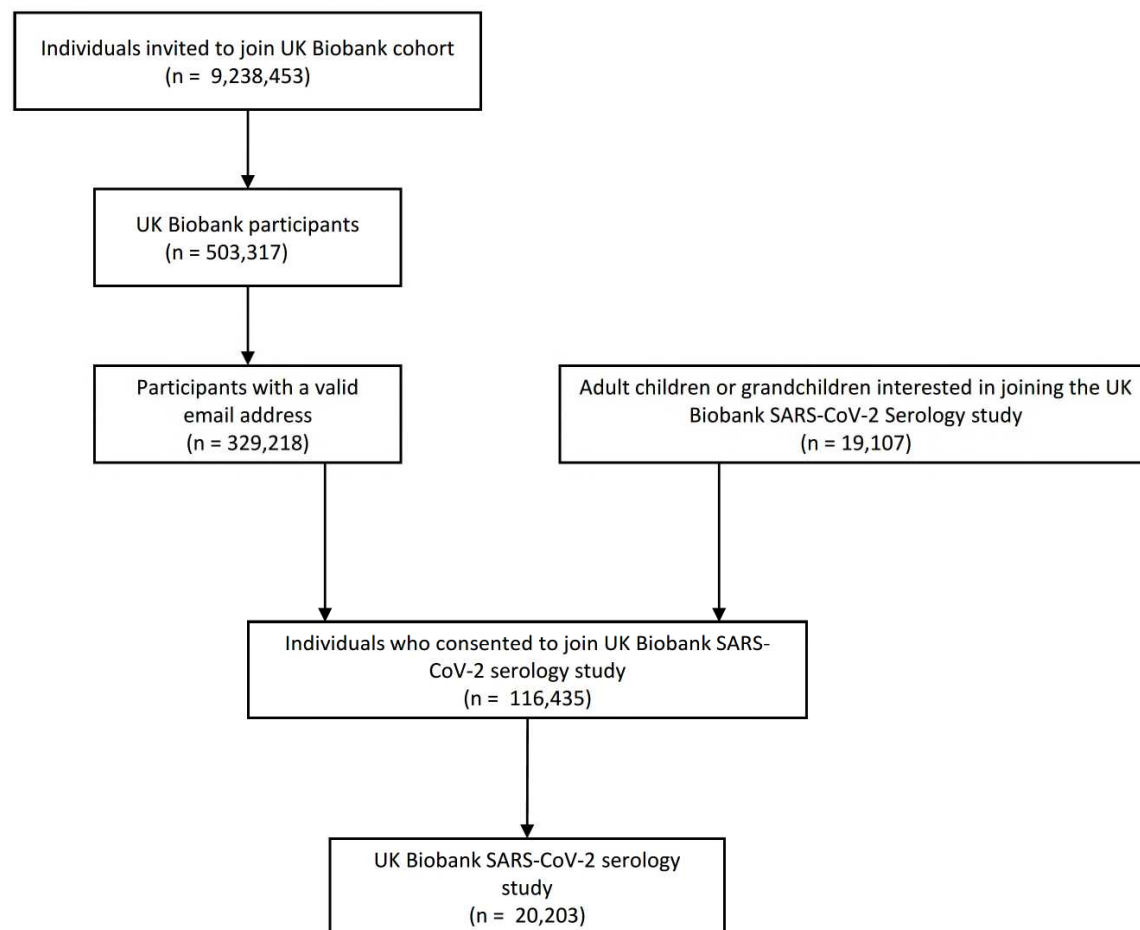
|   | All<br>(n = 14571) | White<br>(n = 12725) | Black<br>(n = 369) | South Asian<br>(n = 396) | Chinese<br>(n = 126) | Mixed<br>(n = 526) | Other<br>(n = 429) |
|---|--------------------|----------------------|--------------------|--------------------------|----------------------|--------------------|--------------------|
| <b>Has a co-resident who works outside the home</b> |                    |                      |                    |                          |                      |                    |                    |
| No / No co-resident                                 | 10069 (69.1)       | 8860 (69.6)          | 230 (62.3)         | 246 (62.1)               | 95 (75.4)            | 354 (67.3)         | 284 (66.2)         |
| Yes   | 4430 (30.4)        | 3807 (29.9)          | 134 (36.3)         | 144 (36.4)               | 31 (24.6)            | 171 (32.5)         | 143 (33.3)         |
| Missing   | 72 (0.5)           | 58 (0.5)             | 5 (1.4)            | 6 (1.5)                  | -                    | 1 (0.2)            | 2 (0.5)            |
| <b>Public transport is usual mode of transport</b>  |                    |                      |                    |                          |                      |                    |                    |
| No  | 11242 (77.2)       | 10062 (79.1)         | 211 (57.2)         | 241 (60.9)               | 68 (54)              | 392 (74.5)         | 268 (62.5)         |
| Yes   | 474 (3.3)          | 377 (3)              | 38 (10.3)          | 9 (2.3)                  | 5 (4)                | 25 (4.8)           | 20 (4.7)           |
| Missing   | 2855 (19.6)        | 2286 (18)            | 120 (32.5)         | 146 (36.9)               | 53 (42.1)            | 109 (20.7)         | 141 (32.9)         |
| <b>Frequency of shopping</b>                        |                    |                      |                    |                          |                      |                    |                    |
| Never/ Less than once a week                        | 3705 (25.4)        | 3309 (26)            | 75 (20.3)          | 91 (23)                  | 19 (15.1)            | 119 (22.6)         | 92 (21.4)          |
| 1 to 2 days per week                                | 6122 (42)          | 5455 (42.9)          | 134 (36.3)         | 115 (29)                 | 40 (31.7)            | 232 (44.1)         | 146 (34)           |
| 3 to 4 days per week                                | 1159 (8)           | 1036 (8.1)           | 26 (7)             | 23 (5.8)                 | 9 (7.1)              | 40 (7.6)           | 25 (5.8)           |
| Missing   | 3585 (24.6)        | 2925 (23)            | 134 (36.3)         | 167 (42.2)               | 58 (46)              | 135 (25.7)         | 166 (38.7)         |
| <b>Deprivation level, n (%)†</b>                    |                    |                      |                    |                          |                      |                    |                    |
| More deprived                                       | 3415 (23.4)        | 2890 (22.7)          | 149 (40.4)         | 83 (21)                  | 24 (19)              | 133 (25.3)         | 136 (31.7)         |
| Average   | 5969 (41)          | 5267 (41.4)          | 139 (37.7)         | 161 (40.7)               | 49 (38.9)            | 194 (36.9)         | 159 (37.1)         |
| Less deprived                                       | 5187 (35.6)        | 4568 (35.9)          | 81 (22)            | 152 (38.4)               | 53 (42.1)            | 199 (37.8)         | 134 (31.2)         |
| <b>Highest level of education</b>                   |                    |                      |                    |                          |                      |                    |                    |
| University or College                               | 9131 (62.7)        | 8020 (63)            | 193 (52.3)         | 246 (62.1)               | 74 (58.7)            | 330 (62.7)         | 268 (62.5)         |
| A-level   | 1602 (11)          | 1439 (11.3)          | 23 (6.2)           | 29 (7.3)                 | 13 (10.3)            | 65 (12.4)          | 33 (7.7)           |
| O-level or CSE                                      | 1850 (12.7)        | 1630 (12.8)          | 62 (16.8)          | 44 (11.1)                | 14 (11.1)            | 63 (12)            | 37 (8.6)           |
| Others  | 1145 (7.9)         | 924 (7.3)            | 67 (18.2)          | 48 (12.1)                | 11 (8.7)             | 42 (8)             | 53 (12.4)          |
| None  | 697 (4.8)          | 593 (4.7)            | 17 (4.6)           | 24 (6.1)                 | 12 (9.5)             | 19 (3.6)           | 32 (7.5)           |
| Missing   | 146 (1)            | 119 (0.9)            | 7 (1.9)            | 5 (1.3)                  | 2 (1.6)              | 7 (1.3)            | 6 (1.4)            |

Analyses among 14,571 participants; exclusions as in figure 1. †Deprivation defined by Townsend deprivation score for postcode; more deprived had score  $\geq 2$ .

**Table S6: Odds ratios for SARS-CoV-2 seropositivity by ethnicity, progressively adjusted for potential explanatory factors (among participants who returned a sample in May, June or July 2020\*)**

|  | Odds ratio (95% CI) |                  |                  |                  |                  |                  | Percent reduction in LR statistics for ethnicity |
|--|---------------------|------------------|------------------|------------------|------------------|------------------|--|
|  | White               | Black            | South Asian      | Chinese          | Mixed            | Other            |  |
| Baseline model (i.e. ethnicity + age + sex)    | 1.00 (0.92-1.08)    | 2.87 (2.16-3.80) | 1.67 (1.20-2.32) | 0.94 (0.44-2.02) | 1.42 (1.06-1.9)  | 1.84 (1.35-2.51) |  |
| + geographic factors                           | 1.00 (0.92-1.09)    | 2.37 (1.78-3.15) | 1.42 (1.02-1.98) | 0.84 (0.39-1.81) | 1.35 (1.01-1.81) | 1.56 (1.14-2.13) | 38   |
| + occupational factors                         | 1.00 (0.92-1.09)    | 2.09 (1.57-2.79) | 1.31 (0.94-1.83) | 0.88 (0.41-1.90) | 1.34 (1.00-1.79) | 1.48 (1.08-2.03) | 54   |
| + household factors                            | 1.00 (0.92-1.09)    | 2.08 (1.55-2.78) | 1.22 (0.87-1.72) | 0.87 (0.41-1.89) | 1.35 (1.00-1.80) | 1.42 (1.04-1.95) | 57   |
| + shopping frequency & use of public transport | 1.00 (0.91-1.09)    | 2.02 (1.51-2.71) | 1.20 (0.85-1.68) | 0.84 (0.39-1.81) | 1.33 (0.99-1.78) | 1.39 (1.01-1.90) | 61   |
| + deprivation & education                      | 1.00 (0.91-1.10)    | 1.98 (1.48-2.66) | 1.20 (0.85-1.68) | 0.84 (0.39-1.81) | 1.32 (0.99-1.77) | 1.37 (1.00-1.89) | 64   |

Odds ratios relative to participants of White ethnicity, adjusted for age and sex (baseline model), with progressive adjustment for social factors where indicated; group-specific variances used to calculate 95% CIs. \*Seropositivity for SARS-CoV-2 defined as positive antibody test in any month. See table S3 for further details on characteristics. LR= likelihood-ratio. LR statistics for ethnicity in the baseline model = 59.8.

**Figure S1: Flowchart of participant recruitment**

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